Engineering Design Report
333 Elliott Avenue West
Seattle, Washington

July 6, 2006

Submitted To:
Martin Selig Real Estate
Attn: Mr. Jim Light
1000 Second Avenue, Suite 1800
Seattle, Washington 98104

By:
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, Washington 98103

21-1-20198-003

TABLE OF CONTENTS

LIST OF FIGURES

Figure No.

LIST OF APPENDICES

Appendix

ENGINEERING DESIGN REPORT
333 ELLIOTT AVENUE WEST
SEATTLE, WASHINGTON

1.0 INTRODUCTION

Shannon & Wilson, Inc. has prepared this Engineering Design Report (EDR) at the request of the Washington State Department of Ecology (Ecology) in accordance with the Consent Decree (described below). The purpose of this plan is to provide a detailed description of the anticipated means and methods to be utilized in the course of construction at 333 Elliott Avenue West (the site), and to present a schedule for the work

1.1 Site Location

The site is located at 333 Elliott Avenue West on the central waterfront of Seattle, Washington, in the southeast quarter of Section 25, Township 25 North, Range 3 East (Figure 1). The tax identification number for the parcel is 766620-2160. The site is bounded by Elliott Avenue West to the northeast, West Thomas Street on the southeast, railroad tracks on the southwest, and 4th Avenue West on the northwest. The site also includes portions of West Thomas Street immediately south of the property.

1.2 Site History

The site was originally part of the Seattle Tide Lands and owned by the J.M. Coleman Company, which operated the Coleman Creosoting Works at the site until about 1912. At that time, the shoreline was located approximately 400 feet northeast of the property and the creosoting works was located on a dock built prior to 1893. Coleman produced and stored creosote at the south end of the property and a portion of West Thomas Street.

In about 1912, J.S. Vining Fuel Company, a supplier of wood and coal, took over occupancy of the property. In the 1920s, the area, including the site, was filled and the shoreline was relocated near to its present location. In the mid 1930s, Furnace Oil Service Company, Inc. occupied the property. In 1940, Crawford's Sea Grill was constructed on the north end of the property. Between 1941 and 1946, all other buildings that were present on the property were demolished.

The current parking lot was paved between 1946 and 1953. In about 1965, Crawford's Sea Grill became Ivar's Captain's Table, which remained in business there until about 1993.

The property has most recently been used as a restaurant and a nightclub. The property is entirely paved, covered with a building, and is currently owned by Martin Selig Real Estate, which purchased the property in March 2005.

1.3 Consent Decree

In November 2002, Ecology entered into a Prospective Purchaser Consent Decree with 333 Elliott Avenue West, LLC, the former owners of the site, to address soil and groundwater contamination related to past site uses. A consent decree is a formal legal agreement filed in court, the purpose of which is to define the potential liability associated with soil and groundwater contamination present at the site for the prospective purchaser, and to facilitate site cleanup and redevelopment. The consent decree includes the requirement that the prospective purchaser carry out the remedial actions specified in the Cleanup Action Plan (CAP) prepared by Environmental Partners Inc. (EPI) dated November 19, 2002 (EPI, 2002)[1], which is included by reference as a part of the consent decree. Additionally, Exhibit C of the consent decree outlines the information required for inclusion in this EDR.

1.4 Cleanup Action Plan

The purpose of the CAP was to present proposed cleanup objectives and remedial alternatives for the site in accordance with Ecology's Model Toxics Control Act (MTCA) regulations. To that end, the CAP presented a site history, a summary of environmental investigations at the site, a conceptual site model, identification of constituents of concern (COCs), development of COC cleanup levels for soil and groundwater, and three cleanup alternatives for meeting the cleanup goals. The CAP was a basis for preparation of this plan. Applicable portions of the CAP are summarized below.

1.4.1 Proposed Development

Development at the site will consist of one five-story office building with one level of underground parking, and an approximately 25,700-square-foot footprint. The underground parking area will extend approximately 14 feet below grade and have 117 parking stalls. Site

[1] Environmental Partners, Inc. (EPI), 2002, Cleanup Action Plan, 333 Elliott Avenue West Property, November 19.

development will also include an outdoor plaza and an at-grade parking lot with sufficient space for 23 parking stalls. Construction at the site will proceed through shoring installation, excavation to the required depth (18 feet below ground surface [bgs] as described below), backfilling to the final basement elevation, footing drain system installation, construction of an impermeable foundation, and abovegrade building construction. It is anticipated that from the beginning of shoring installation to completion of the impermeable foundation, construction will take approximately 6 months. Construction time is expected to take approximately 1½ years.

1.4.2 Constituents of Concern

The COCs identified in the CAP for the site are total naphthalenes and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Total naphthalenes include naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, while the chemicals included as cPAHs are benzo(a)pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene.

The cleanup levels developed in the CAP for total naphthalenes in soil are 1,600 milligrams per kilogram (mg/kg) for the top 15 feet of the site and 2,500 mg/kg for soil below 15 feet. The cleanup level for cPAHs is 0.133 mg/kg for soil above 15 feet bgs and 30 mg/kg for soil below 15 feet bgs. The cleanup value for cPAHs is a toxicity equivalency factor (TEF) adjusted sum value of all the cPAHs. The TEF adjustment compares the relative toxicity of each cPAH to benzo(a)pyrene, which is the most toxic of the group, and adjusts the concentration so that each cPAH concentration is approximately equivalent to the same concentration of benzo(a)pyrene. This way the cPAHs can be handled as a group rather than as individual constituents.

1.4.3 Cleanup Alternatives

The three cleanup action alternatives presented in the CAP are: (a) no action, (b) excavation and disposal of contaminated soil, or (c) leaving contaminated soil in place and rerouting contaminated groundwater to a sewage treatment system. The alternative selected, based on the proposed development of the site, was excavation of contaminated soil.

Full implementation of the selected alternative will include the following:

- Contaminant source removal of soils with off-site disposal
- Compliance sampling to ensure that source removal is completed
- Groundwater collection, containment, and treatment during excavation
- Groundwater collection, control, and treatment during basement dewatering
- Groundwater compliance monitoring

Contaminant source removal will involve excavation of the top 18 feet of soil from the entirety of the site, from lot line to lot line, to the extent allowed by shoring. Additional excavation to a maximum depth of 26 feet bgs, or to the extent practical, will be conducted in areas that exceed the site-specific cleanup levels defined in the CAP. In addition, an area on the south end of the property that extends into West Thomas Street, as shown in Figure 2, will be excavated to 24 to 30 feet bgs depending on confirmation sampling results. Site characterization data indicate that the largest mass of contaminated soil is located within this suspected source area. Removal of this contamination should significantly reduce future groundwater contamination at and downgradient of the site. Excavation details are included in Section 2.0. Dewatering fluids generated during the anticipated 6 months that the excavation will be open and require dewatering will be collected and treated prior to discharge as detailed in Section 3.0. The dewatering fluids will then be discharged to a combined sewer located at the site perimeter and to re-injection wells located at the southwest and northwest corners of the site. The purpose of the re-injection is to reduce potential settlement at the adjacent railroad tracks. Soil and groundwater confirmation and compliance sampling will be conducted during and following excavation, as detailed in Section 4.0. Groundwater removed by the building's under-slab foundation drains will be sampled, treated, and discharged as detailed in Section 5.0.

2.0 EXCAVATION PLAN

As presented in the CAP, the top 18 feet of soil at the site will be excavated from lot line to lot line across the entirety of the site, with additional overexcavation to a maximum depth of 26 feet bgs, depending on the results of confirmation sampling and to the extent practical. Soil in the suspected source area at the south end of the site will be excavated to at least 24 feet bgs and may extend as deep as 30 feet bgs, depending on the results of confirmation soil samples collected from the excavation bottom. The proposed limits of excavation and expected levels of contamination based on available site characterization data are shown in Figure 2, Sheets 1 through 6. Specification sections for contaminated soil excavation, handling and disposal, as well as a health and safety, are included in Appendix D. A full site-specific health and safety plan is included in Appendix E.

2.1 Excavation Shoring

The north, south, and east excavation walls will be shored using a combination of wide-flange, I-beam soldier piles with lagging and tiebacks. The soldier piles will be installed on 5.75- to 8-foot centers around the entire excavation perimeter. Lagging, consisting of 4X pressure-treated timbers, will be placed between the soldier piles. Any void space between the lagging and the outer soil wall will be immediately backfilled following lagging installation. One row of tiebacks will be installed in the areas to be shored down to 18 feet bgs. In the deeper, 24- to 30-foot section, two rows of tiebacks will be installed as shown in the plans. The west excavation wall will be shored using a semi-impermeable secant-pile wall to minimize potential settlement of the adjacent railroad tracks due to dewatering. The secant-pile wall will be constructed by installing a series of 3-foot-diameter boreholes on 5-foot centers to a depth of approximately 30 feet bgs across the length of the western property boundary. A wide-flange I-beam will be placed in each borehole, and the rest of the borehole volume will be filled with a lean-mix concrete. Once the concrete has cured sufficiently, an additional borehole will be placed between each of the existing boreholes and filled with lean-mix concrete. The resulting secant-pile wall should create an impermeable barrier to prevent dewatering efforts at the site from causing settlement of the adjacent railroad tracks.

Installation of the soldier piles may be carried out concurrently with excavation at the site. If this occurs, the Contractor will begin excavation near the middle of the site, maintaining a minimum 1-to-1 slope on any sidewall. Once soldier piles are in place, the excavation will be extended to the lot lines and the lagging will be installed, working in 5- to 10-foot lifts. A soil or quarry spalls ramp will be left in place on the north end of the site to allow for vehicle access to the excavation. The shoring plans prepared by KPFF Consulting Engineers are presented in Appendix A.

2.2 Excavation

Excavation will be conducted using one or more track-mounted excavators. The excavation will start at the south end of the site and work north. The excavation will be conducted by first removing one, approximately 10-foot lift, followed by an 8-foot lift. Additional shoring will then be installed around the source area, which will then be excavated in 5-foot lifts to the total final depth. In the event that soil contaminated above the cleanup level is encountered at 18 feet bgs outside the source area, additional excavation in the vicinity will be conducted to the extent practical. Based on the current shoring system, additional excavation could not occur within 31 feet of the shoring walls. Excavation outside of this 31-foot offset could be conducted as long as the temporary excavation sidewalls are sloped at a 2:1 gradient. This will leave a sufficient soil wedge to resist the passive earth pressure exerted on the shoring wall. Additionally, the current dewatering system (as described in Section 3.0) allows only for excavation to approximately 22 feet bgs. If excavation below the water table is required, this may necessitate installation of additional dewatering sumps or dewatering wells.

Based on the results of past site characterization studies, the top 10 feet of soil at the site is expected to be uncontaminated. Some areas of the site may be uncontaminated to the full depth of 18 feet bgs. According to Section 5.0 of the CAP, uncontaminated soil can either be reused or disposed of as clean fill. Shannon & Wilson personnel will be on site to visually screen excavated material for signs of contamination and to characterize soil for disposal or reuse as specified in Section 4.1.

It is expected that treated timber piers will be encountered during excavation. These piers are remnants from prior site filling, when the shoreline extended to the east and the facility at the site was situated above the water. Timbers that are encountered will be pulled and disposed of along with the contaminated soil at a Subtitle D facility. The holes left after a pier is removed will be filled with clean soil and compacted once excavation in the area has reached the final depth.

Excavation of contaminated soil will be carried out using dedicated equipment to minimize the potential for cross-contamination. If a backhoe or other piece of dedicated equipment is needed for excavating and/or handling potentially clean soil that may be reused, then the equipment will be decontaminated in accordance with Section 2.5 prior to using it on uncontaminated soil.

2.3 Soil Stockpiling

Excavated uncontaminated soil will either be stockpiled on site for later use, or direct loaded onto trucks for off-site disposal or off-site stockpiling, depending on space restrictions. Stockpiles of uncontaminated soil will be placed on the ground in an area of known uncontaminated soil, or on 6-millimeter-thick visqueen sheeting if the ground in the stockpile area is potentially or known to be contaminated.

Contaminated soil will be direct loaded for disposal, or temporarily stockpiled on site in the event of an interruption of hauling service. Any contaminated or potentially contaminated soil stockpiles will be placed on, and covered with, 6-millimeter-thick visqueen sheeting. These stockpiles will be located in secure locations and bermed with straw bales or an equivalent material in such a way as to prevent surface water run-on and/or run-off. On- and off-site stockpiles will be inspected daily to ensure their integrity.

2.4 Soil Disposal

Soil to be disposed of will be loaded directly into trucks for transport to the appropriate Resource Conservation and Recovery Act (RCRA) Subtitle D disposal facility as described below. Truck loading will be staged outside of the excavation so as to prevent truck tires from being contaminated with site soil. Any trucks that enter the excavation will be inspected prior to exiting the site to prevent tracking of contaminated soil off site. All trucks hauling contaminated soil will be lined with 6-millimeter or thicker vizqueen liners or an equivalent, and covered during transport. The liners will be disposed of as contaminated waste along with the soil.

Per Section 5.0 of the CAP, there are four disposal options for soil excavated at the site:

- Soil that is screened and found to be uncontaminated as clean fill at the site, disposed of as clean fill off site, or used in any way that will not cause a threat to human health or the environment.
- Soil containing less than 1 percent (10,000 mg/kg) contaminant will be disposed of at RCRA Subtitle D landfill in the State of Washington.
- Soil containing greater than 1 percent, but less than 10 percent (100,000 mg/kg) contaminant may be disposed of at any RCRA Subtitle D facility outside the state of Washington that is authorized to accept this waste.
- Soil containing greater than 10 percent of any contaminant must be disposed of at a RCRA Subtitle C facility, outside the state of Washington. This waste must be treated and/or disposed of in an equivalent manner to a waste carrying a RCRA F034 waste code.

Based on the current site characterization data, the approximate amount of soil likely to contain greater than 1 percent but less than 10 percent naphthalene is about 1,300 to 1,765 tons in the source area and in an isolated area along the west property boundary (Figure 2). No soil exceeding 10 percent naphthalene has been detected in any of the soil borings or geoprobes conducted at the site. However, one well at the site has been found to contain free product during bi-annual sampling, so saturated soil that exceeds 10 percent contamination may be present at the site.

2.5 Equipment Decontamination

Once excavation at the site is complete, all equipment involved will require decontamination to remove residual free product. Decontamination will proceed with an initial rinse using a hand-held pressure washer to remove large pieces of soil and free product. The initial wash will be followed with a kerosene wash to remove free product that adheres to the machinery. A final water rinse to remove residual kerosene will follow the kerosene wash. The equipment decontamination will be conducted on a puncture-proof surface with secondary containment capable of preventing a release of decontamination fluid to the surrounding soil. The decontamination fluids will be collected and transferred to the dewatering treatment system (described in Section 3.2 below) for treatment and discharge.

3.0 EXCAVATION DEWATERING

Construction dewatering will be required to control groundwater inflow and reduce hydrostatic uplift pressures on the base of the excavation. The depth to groundwater at the site ranges from approximately 5 to 14 feet bgs across the site. Groundwater will be maintained below the bottom of the temporary excavation during soil removal and ground improvement work. The following evaluations are based on the assumed excavation dimensions and depths, previous subsurface studies, and the results from an aquifer testing program.

3.1 Dewatering Design Parameters

The estimated total groundwater discharge from the site dewatering system could be up to about 250 gallons per minute (gpm). The rates should decrease over time as the saturated thickness of the water-bearing soils decreases as a result of dewatering. Our analyses included the secant-pile wall and recharge wells to reduce potential drawdown beneath the railroad tracks. The analyses indicate the drawdown beneath the tracks may be up to 3 feet. Without the use of a secant-pile wall or recharge wells, drawdown may be up to 15 feet below the tracks and would likely extend up to 400 feet from the excavation (about 1 foot of drawdown). If subsurface conditions differ during construction or if soils are in close hydraulic connection with Puget Sound, the groundwater discharge may be greater.

Groundwater flow into the excavation will be controlled by using a vacuum-extraction wellpoint system around the three sides of the excavation, large-diameter dewatering wells within the excavation and recharge wells at the west and south corners of the excavation. Wellpoints will not be installed along the secant-pile wall; instead, deep dewatering wells will be installed within the excavation to control water levels along the wall. The dewatering system will also reduce hydrostatic uplift pressures below the bottom of the excavation. The practical lift limitation of a vacuum-extraction wellpoint system is about 18 to 22 feet. Because the assumed excavation depth (18 feet bgs) across much of the site is within this range, the groundwater level between active wellpoints may not be lowered below the base of the excavation. Reduction of groundwater levels between wellpoints may necessitate: (a) more closely spaced wellpoints, (b) additional blowers to increase the efficiency of the wellpoint system lift capability, (c) additional wellpoint stages at greater depth, (d) installation of wellpoints from a lower grade, and/or (e) installation of additional dewatering wells with submersible pumps to remove water that is deeper than the lift limit of a wellpoint. In the southeast corner where the excavation depth is greater, or in areas where confirmation sampling requires excavation below 18 to 22 feet, one or more of these methods will be required. The wellpoint spacing will vary depending on the subsurface soils encountered during drilling and the efficiency of the vacuum pump selected for the system. Based on the analysis performed, a well spacing of about 5 to 10 feet between wellpoints in areas on the southern half of the site, and up to 25 feet in areas on the northern half of the site will be required. Wellpoint flow rates would likely be highest on the north half of the site and in the vicinity of MW-6, near the southwest corner of the site, where tested soils had higher hydraulic conductivity. Rates may vary from about 1 or 2 gpm per wellpoint on the southern half of the site to over 10 gpm per wellpoint on the northern half and near MW-6. Actual wellpoint rates will also depend on the well spacing used and the efficiency of the vacuum pump.

Based on the evaluation using various well spacing configurations, at least 90 wellpoints will likely be necessary to meet dewatering requirements. In addition, four to five deep dewatering wells and/or additional wellpoint lifts and stages may be necessary to remove water from areas of deeper excavation, e.g., in the southeast corner of the site. A total of six recharge wells will be necessary (three at the west corner and three at the south corner) to reduce drawdown caused by the dewatering system below the nearby tracks during construction. Once the construction dewatering system is turned off, the recharge wells will be abandoned. The water re-injected through the recharge wells will be treated to remove contamination using the dewatering treatment system described in Section 3.2.1 below. Wells and wellpoints will extend to a depth far enough below the excavations to provide adequate available drawdown within each well/wellpoint to lower water levels sufficiently between well/wellpoint locations. Deep dewatering wells may also be necessary to relieve hydrostatic pressure in a deeper gravel layer that is present in the vicinity of MW-6 below about 28 feet. Dewatering will begin a minimum of 2 weeks prior to excavation below the water table in order to provide sufficient pre-drainage of soils. Observation wells will be installed during construction to monitor water levels and the effectiveness of the dewatering system. Observation well locations will be approximately as shown in Figure 2. Existing monitoring wells MW-14 and MW-19 will be used for observation wells on the south end of the site as shown in the figure. Observation well OW-1, located on the west side of the secant pile wall, will be located in a temporary easement that will revert to BNSF control following construction. At that time, OW-1 will be decommissioned and no longer used as an observation well.

3.2 Water Treatment and Disposal

Groundwater at the site is contaminated with PAHs and naphthalenes. The highest detected concentrations of these chemicals at the site during the latest groundwater monitoring event in May 2005 were 960 micrograms per liter (μg/l) of total naphthalenes in monitoring well MW-16, and 0.411 μg/l of combined TEF Modified cPAHs in MW-6D. Water withdrawn during dewatering will therefore require treatment prior to re-injection and discharge to the combined sewer. Additionally, dense non-aqueous phase liquid (DNAPL) is known to be present in the vicinity of MW-6D and is suspected to be present in the source area. It will be necessary to remove DNAPL from dewatering water prior to discharge.

3.2.1 Treatment System Components

Water treatment will be accomplished using a multi-unit system similar to the one shown in Figure 7. The system will include a large weir tank, oil-water separators (OWS), particulate filter units, and granular-activated carbon (GAC) vessels connected in series. The individual system units are summarized below. Specifications and cut sheets for example units are included in Appendix B.

Weir Tank: Influent to the system will be fed into one or more 18,100-gallon or larger weir tanks. The tanks will be equipped with over and under weirs for removal of settleable solids and DNAPL. The tank will also be equipped with a sorbent boom at the inlet to remove any floating free product.

The tank will be inspected daily for floating free product, which will be skimmed from the water surface and placed in Department of Transportation (DOT)-approved metal drums. The tank bottom will be drained once a week to remove DNAPL that settles out of the waste stream. The free product and settleable solids removed from the tank will be sampled and disposed of at a Subtitle C facility or a Subtitle D facility depending on the concentration of the waste and the ability of the facility to accept the waste.

Oil-water Separators: The weir tank will be followed by two OWS linked in series to remove NAPL not removed in the weir tank. The OWS will be inspected daily for NAPL accumulation and drained and cleaned as needed.

Filter Unit: Following the OWS will be a bag filter/cartridge filter unit. The purpose of this unit is to remove fine suspended solids that could clog the GAC vessels in the final polishing step. The filter unit will be composed of four bag filters and two cartridge filters capable of removing particulates down to 0.5 micron in size. A pump will be required at the inlet of the filter unit since gravity flow may not be sufficient to maintain a steady flow through the unit.

Granular-activated Carbon Vessels: The final step in the treatment system will be a series of GAC treatment vessels for removal of dissolved COCs from the discharge stream. Based on an average flow rate of 450 gpm, a total dewatering duration of 6 months, and an approximate COC influent concentration of 1 ppm, it is estimated that 12,000 lbs of carbon will be needed to treat the discharge water over the course of the project. Therefore, the carbon vessels will be piped in series with two sets of three 2,000-lb GAC vessels or two 3,000-lb vessels in an interchangeable lead-lag formation. In this type of formation, the influent water enters the first vessel (the lead), which has sufficient GAC to fully treat the influent to the discharge criteria. The effluent from the lead vessel is then discharged to a second, redundant vessel (the lag), which contains the same amount of GAC as the lead. The system will be piped and valved in such a way that the lead vessel can be switched to the lag vessel and the lag switched to the lead if breakthrough from the lead occurs. Monitoring ports will be installed after each vessel so that the post-lead and post-lag water can be sampled for COC breakthrough as discussed in Section 4.2. Once contamination is detected in the effluent from the lead tank, the influent will be piped temporarily through just the lag vessel while the carbon in the lead vessel is changed out. The system valves would then be adjusted so that the lead and lag vessels are interchangeable.

3.2.2 Discharge

Acceptable effluent from the treatment system will initially be discharged to a combined sewer manhole located on the north end of the site in 4th Avenue West. At a later point in the project, the discharge may be rerouted to a storm sewer located at an adjacent property. The King County Metro Sewer discharge screening (i.e., not to be exceeded) and total daily limits for the COCs are:

- Naphthalene — Screening level: 3.75 milligrams per liter (mg/L) — Daily limit: 0.2 pound/day
- cPAHs — Screening level: None — Daily limit: 200 mg/day[2]

Water samples will be collected weekly in accordance with Section 4.2 for analysis of COCs. If effluent concentrations are found to exceed the screening level or daily limits, then either the treatment vessels will be interchanged, new carbon will be added to the existing vessels, or an additional carbon vessel will be added for greater contaminant removal. Additionally, all requirements of the King County Metro sewer discharge permit and all applicable stormwater permits required for discharge to the combined sewer and storm sewer, respectively, will be strictly enforced.

3.2.3 Stormwater

Any residual stormwater entering the excavation will be collected in a sump located in the lowest end of the excavation. The sump will be equipped with a float-switch-activated sump pump to transfer stormwater to the dewatering water treatment system for treatment and discharge. The excavation will be bermed to prevent stormwater from adjacent roadways from entering the excavation.

[2] The daily limit for cPAHs is for the total sum of the concentration of all cPAHs, not a TEF modified sum value.

4.0 SAMPLING AND ANALYSIS PLAN

Screening and sampling of soil and dewatering fluids will be conducted during and following construction as described in this section to fulfill the requirements of the consent decree. Confirmation sampling of on- and off-site monitoring wells will be completed following construction as discussed in Section 5.0. Protection monitoring for COC vapors at the site perimeter will be performed during construction in accordance with Section 6.0 of the Site-Specific Health and Safety Plan included in Appendix E.

4.1 Field Screening and Stockpile Soil Sampling

Field screening will be conducted in areas where potentially contaminated soil is encountered. Screening will be conducted by analyzing bag samples of potentially contaminated soil with a photoionization detector (PID). Bag samples will be collected by placing an amount of soil in a ziplock bag, agitating the bag to release volatile constituents, and then placing the tip of the PID in the bag to take a reading. Soil that has noticeable staining and/or has a reading above the background level using the PID will be considered contaminated.

Soil that is segregated as contaminated due to field screening results may be sampled for waste designation if the soil appears to contain sufficient contamination as to exceed 10 percent of any contaminant by volume. This soil will be sampled and analyzed for PAHs and will be disposed of at a RCRA Subtitle C facility if it contains greater than 10 percent of any contaminant. Otherwise, it will be disposed of in accordance with the requirements of Section 2.4 above.

4.2 Performance Soil Sampling

Performance soil sampling will be conducted to confirm the extent of contamination remaining at the site and to determine the ultimate depth of excavation in the source area on the south end of the site. Performance samples will also be taken from the excavation sidewalls to assess the extent of contamination left in place at the site boundaries following excavation, if any.

4.2.1 Sample Collection and Analysis

Where practical, performance samples will be collected directly from the excavation bottom or sidewall behind the shoring wall lagging using a clean, stainless steel spoon. In areas where the excavation is too deep to enter safely, in the vicinity of unshored sidewalls, or for samples to be collected from the western sidewall where the secant-pile shoring wall will be installed, the sample will be collected using a stainless steel spoon from the excavator bucket or, in the case of the western shoring wall, directly from the auger flights. For samples from the excavator bucket, the stainless steel spoon will be used to remove approximately 6 inches of slough from the soil in the bucket, and then the sample will be collected from the soil beneath. For samples collected from the auger, the sample will be collected by scraping away at least 2 inches from the exterior, and then the sample will be collected from the soil behind. All performance samples will be grab samples.

All soil samples will be immediately placed in laboratory-supplied, 4- or 8-ounce glass jars. Sample jars will then be placed in a cooler with ice and maintained at a temperature of $4^{o}C$ ±2 degrees for analysis by an on-site mobile laboratory, or transported to a fixed-based analytical laboratory. At the end of each day, all samples to be taken off site will be transported under chain-of-custody procedures to the analytical laboratory and analyzed for total naphthalenes by U.S. Environmental Protection Agency (EPA) Method 8270 SIM. Samples will usually be analyzed on a standard 7- to 10-day turnaround time; however, samples collected from the source area excavation may be analyzed on an expedited turnaround. Samples analyzed by the mobile laboratory will be analyzed for PAHs using EPA Method 8100.

Field quality assurance/quality control (QA/QC) will include the collection of field duplicate samples from 10 percent of the performance samples. These duplicate samples will be split samples from the same location as the corresponding performance sample. Each duplicate will be submitted to the analytical laboratory as a blind sample with its own unique identification number. The duplicate samples will be used to evaluate the reproducibility of the soil sample results. If more than 20 percent of the field duplicate sample analytical results from a batch exceed a variance of 10 percent the value of their corresponding split sample, or any one sample exceeds a 20 percent variance, then the laboratory QA/QC data for that batch of samples will be carefully checked and additional internal laboratory QA/QC verification may be required.

On-site personnel will record all sample information in a field notebook. Information recorded during sampling will include the date and time of sample collection, sampling location, sample number, whether the sample is a duplicate, and if it is, the sample it is a duplicate of, and any other pertinent information.

4.2.2 Excavation Bottom Sampling

At least one soil performance sample will be collected for every 200 square feet of excavation bottom. Figure 4 shows the approximate location of each sample. If a performance sample is found to contain COCs above the remediation level, then additional excavation will be conducted in the area of the exceedance to the extent practical, and the new excavation bottom will be sampled. The excavations will be advanced and re-sampled at 1-foot intervals or based on field screening. If additional excavation is not feasible due to shoring limitations, then Ecology will be notified and a site Operations and Maintenance Plan will be created to ensure protection of human health and the environment. Soil samples in this area will be collected at the proposed bottom at 24 feet bgs. If any of these samples contain total naphthalenes in excess of the remediation level, then additional excavation will be conducted and the new excavation bottom will be sampled. This will continue until no bottom sample contains total naphthalenes above the remediation level, or the excavation reaches the maximum safe shoring depth of 30 feet bgs.

4.2.3 Excavation Sidewall Sampling

Sidewall samples will be collected to document any contamination left in place following excavation at the site, if any. As outlined in the CAP, one sidewall sample will be collected for every 20 linear feet of sidewall at 5-foot depth intervals, so at least one sample will be collected for every 100 square feet of sidewall. Sidewall samples will be collected from the bare excavation face or behind lagging along the north, east, and south shoring walls, and directly from the secant pile installation augers along the western property boundary. Figures 5 and 6 show the approximate location of each sidewall sample.

4.3 Water Sampling

As discussed in Section 4.0, the excavation will be dewatered using a series of wellpoints. Excavation dewatering fluids will be collected and treated to remove contamination using activated carbon absorber vessels in a lead/lag formation. The treatment system will be equipped with sample ports so that water samples can be collected prior to treatment by the lead vessel, directly after the lead vessel (and prior to entering the lag vessel), and following the lag vessel prior to ultimate discharge.

Water samples will be collected from each sample port of the excavation dewatering treatment system semi-weekly for the first two weeks of system operation. During this initial sampling, samples will be collected from the influent to the granular activated carbon (GAC) vessels, from the post-lead vessel effluent, and from the post-lag vessel effluent. Following this initial period, the samples will be collected every 2 weeks only from the post lead vessel effluent and post lag vessel effluent. A sample will also be collected from the influent to the system on a monthly basis. The samples will be collected by first placing a 5-gallon bucket underneath the sample port to collect any stray purge water discharged from the sample port. The sample port will then be opened and adjusted so that the flow is approximately laminar. The sample will then be collected by filling two laboratory-supplied, 1-liter, unpreserved, amber glass sample jars. The jars will be labeled and placed in a cooler with ice and maintained at approximately 4^{o}C for transport to the lab. The samples will be transported at the end of each day to the analytical laboratory for analysis of PAHs by EPA Method 8270 SIM. Samples collected in the first 2 weeks will be analyzed on a 24-hour turnaround time to minimize the loading on the lag vessel should breakthrough occur. Samples collected during the following weekly sampling will be run on 48-hour turnaround times. Following sample collection, any purge water collected in the 5-gallon bucket will then be poured back into the treatment system.

5.0 POST-CONSTRUCTION REMEDIATION AND MONITORING

Groundwater remediation will continue at the site following construction, using the building's under-slab foundation drain system in conjunction with a treatment system to remove and treat contaminated groundwater.

5.1 Foundation Drain System

As outlined in the CAP, a permanent foundation drain system will be constructed for the proposed building. The purpose of the drain system is to contain groundwater contamination generated by contaminated soil remaining in the soil below and upgradient of the building following construction. The foundation drain plan is included in Appendix C.

The drains will extend to a total depth of at least 18 feet bgs to fully penetrate the lower aquifer at the site. Because the building will be constructed with an impermeable foundation, the drain system will be operated at a flow rate sufficient to contain groundwater contamination at the site, rather than at the operating capacity required to keep a permeable foundation dry. Operation of the drainage system at full capacity would cause drawdown outside of the site, including beneath the railroad tracks, potentially resulting in ground settlement. Instead, the drain system will be designed and operated to prevent underflow and the off-site migration of contaminated groundwater by inducing a hydraulic gradient toward the drain system throughout the site. The drain system flow rate will be controlled using valves so that approximately 1 to 2 feet of drawdown occurs at the edge of the site, indicating a groundwater gradient from the perimeter to the center of the site. Drawdown will be monitored with the observation wells placed on the perimeter of the site as shown in Figure 2. If monitoring of the observation wells indicates that a the hydraulic gradient induced by the drain system is insufficient to capture the contaminated groundwater in the general vicinity of the site, the system will be modified to increase the hydraulic gradient toward the system.

Groundwater collected in the foundation drains will be routed to a treatment system similar to the excavation dewatering treatment system described in Section 3.1.1. However, because stormwater retention is not required for the drain systems and no free product is expected to be entrained in the drainage water, the weir tanks and OWS used in the dewatering system will not be incorporated into the foundation drainage system. Instead, the water will be pumped directly into a bag filter assembly and then into two GAC vessels valved in lead-lag formation as described in Section 3.1.1.

5.2 Groundwater Monitoring

Samples will be collected from the foundation drain treatment system, and drawdown measurements will be collected from the observation wells installed on the site perimeter on a weekly basis for the first month following startup, monthly for the next 3 months, and quarterly from then on. The system will operate until the influent to the treatment system is shown to contain no levels of COCs exceeding the groundwater cleanup levels of 4,938 μg/L for naphthalenes and 0.0296 cPAHs for four consecutive quarterly sampling events and the point of compliance wells, MW-13, MW-14, MW-16, MW-17, and MW-18 as shown in Figure 8, are below the cleanup standard.

Samples will be collected in a manner similar to that described above for the dewatering treatment system. Additionally, groundwater level measurements will be collected from the observation wells around the perimeter of the site to monitor the influence of the drain system, and groundwater samples will be collected on a semi-annual basis from the point of compliance wells for three years. If groundwater monitoring data do not show the expected improvement after three years, sampling will continue with two monitoring events (one wet-season, one dry-season) every three years until the wells are in compliance. All groundwater samples will be analyzed for PAHs to include naphthalene and cPAHs by EPA Method 8270 SIM.

6.0 SCHEDULE

Installation of the soldier piles for shoring is expected to begin on July 3, 2006. Drilling and installation of the secant pile wall are expected to begin on August 1, 2006, with the expectation of beginning excavation on August 8, 2006, and lasting until October 9, 2006. The under-slab drain system is expected to be complete by September 6, 2006, at which time the construction dewatering system will be switched off and the under-slab drain treatment system will be switched on. Substantial completion of aboveground construction is expected to be complete by October 2007.

7.0 RESTORATION TIME FRAME

Based on the results of aquifer tests conducted at the site by Shannon & Wilson, the expected travel time of water from the site to the point-of-compliance (POC) wells located in Myrtle Edwards Park is approximately 2 years. This is the amount of time that groundwater currently at the site will take to travel to these POC wells; therefore, the amount of time between the start of excavation at the site and a significant reduction in COCs is expected to be observed in these wells. This assessment is based on aquifer tests performed at the site. Differing hydrogeologic conditions downgradient of the site may affect this travel time.

One POC well (MW-13) was found to contain cPAHs above the compliance level during the May 2005 and January 2005 monitoring events. If this well remains out of compliance for four more quarters, Martin Selig Real Estate will conduct an investigation, consisting of some level of soil and/or groundwater sampling, to determine possible causes for this well's remaining out of compliance.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of Martin Selig Real Estate and its representatives. The analyses, conclusions, and recommendations presented in this report are based on conditions encountered at the time of our study and on our experience and judgment.

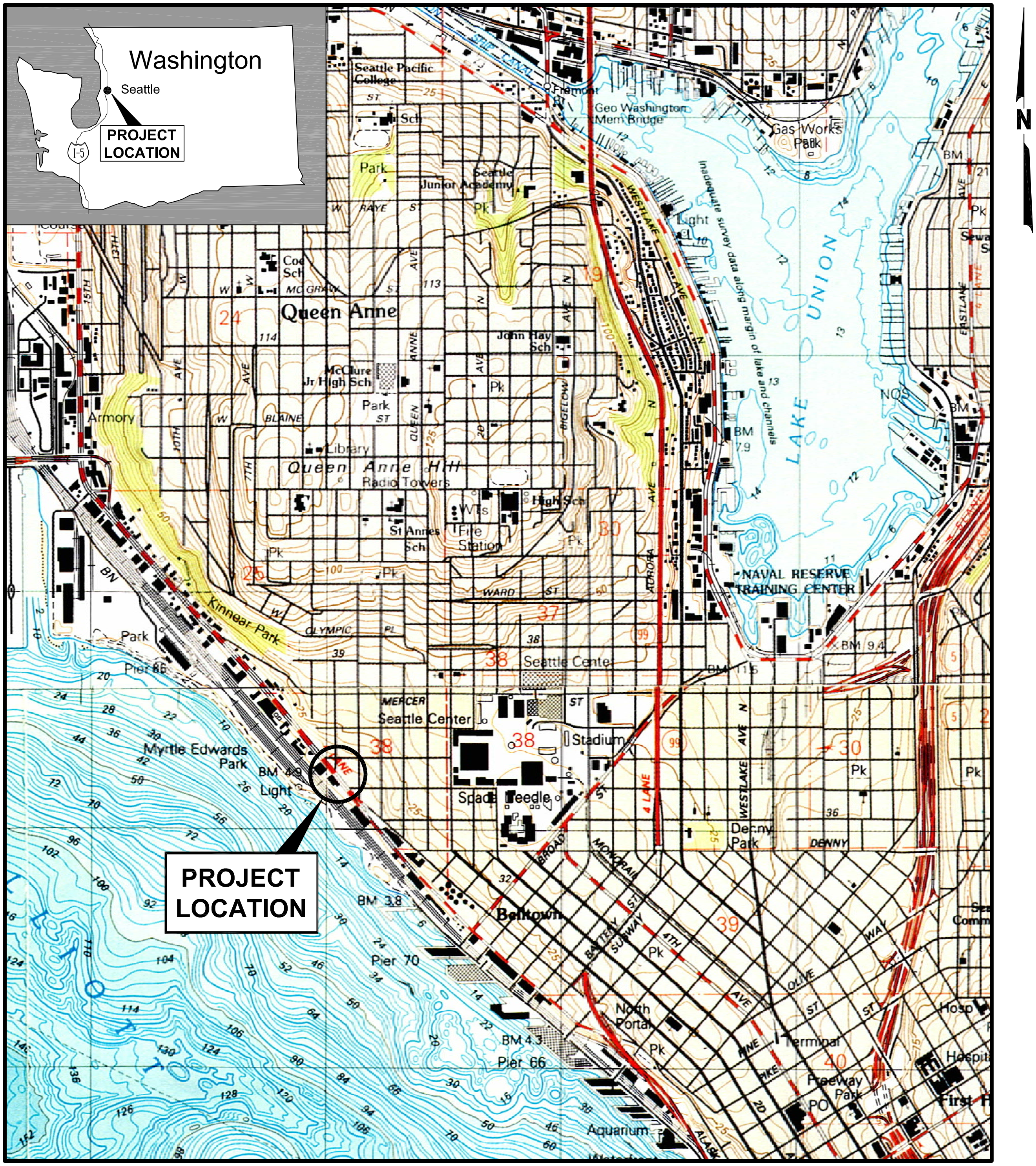
Shannon & Wilson cannot be held responsible for the interpretation by others of the data contained in this report. The information presented in Appendix F, "Important Information About Your Environmental Report," is provided to assist in understanding the use and limitations of our report.

SHANNON & WILSON, INC.

Cody M. Johnson, P.E.
Engineer

Scott W. Gaulke, P.E., L.H.G.
Vice President

CMJ: SWG/cmj



0 1/2 1

Scale in Miles

NOTE

Map adapted from 1:24,000 USGS topographic maps of Seattle North and Seattle South, WA quandrangles, dated 1983.

Engineering Design Report
333 Elliott Avenue West
Seattle, Washington

VICINITY MAP

July 2006 21-1-20198-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1

File: J:\211\20198-003\June 2006 Draft Report\21-1-20198-003 Fig 1.dwg Date: 07-07-2006 Author: draftemp